MONTHLY JOURNAL OF
THE MUSHROOM GROWERS'
ASSOCIATION

MGA BULLETIN

JUNE, 1961 · NUMBER 138

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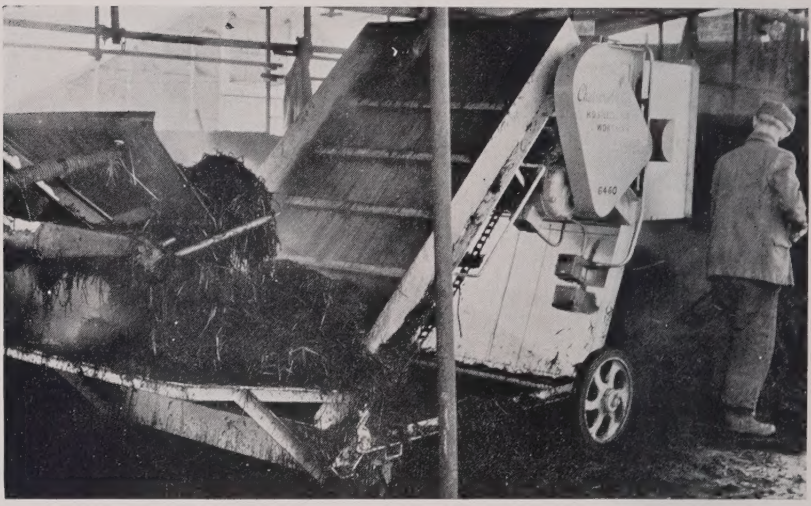

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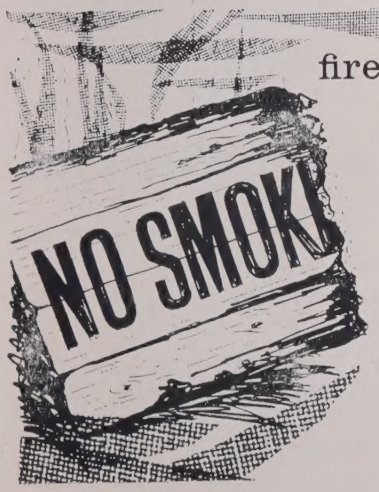

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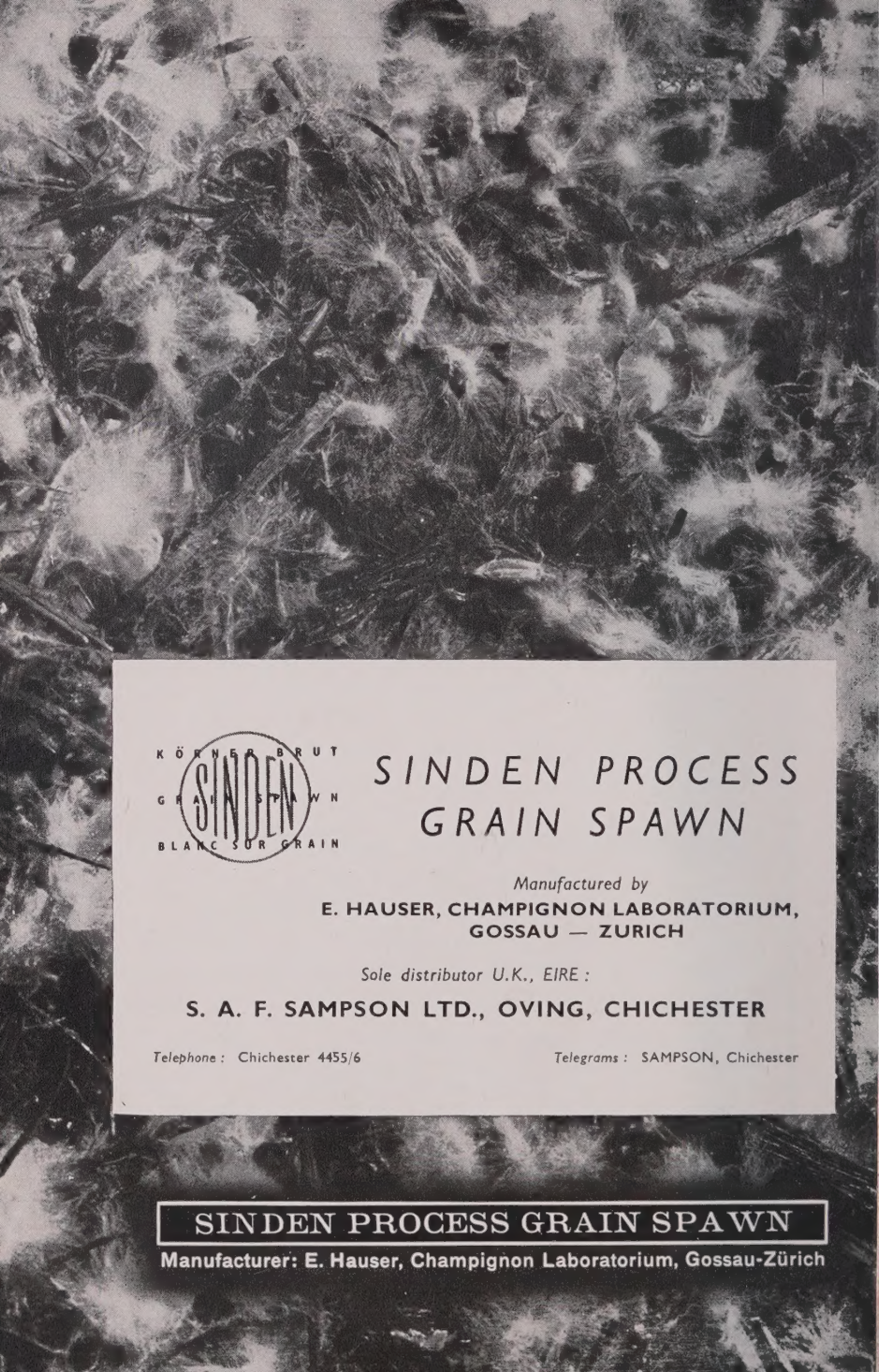

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MGA BULLETIN

JUNE - 1961
NUMBER 138

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No responsibility can be accepted by the Editor, the Editorial Board, or the Mushroom Growers' Association for statements made or views expressed in this Bulletin, or for any advertisements included in this publication.

EDITORIAL

CLASSIC EXAMPLE

The decision of the Chancellor of the Exchequer to forgo the 2d. per gallon tax on fuel oil used in the horticultural industry is a classic example, one that should be shouted from the rooftops, of the great advantage of close and loyal co-operation amongst growers.

We, in the mushroom industry, have for many years endeavoured to speak with one voice and, within the limitations of our small but important sphere, our efforts may be said to have been reasonably successful although we would be the first to agree that there is still room for improvement.

It is surely completely beyond dispute that this tax, an iniquitous affair as far as the horticultural industry was concerned, would never have been removed if the protests had come from individuals.

All credit must go to the NFU and particularly the horticultural section of the Union who, from the very first, were most industrious in preparing a case against the tax. The MGA was associated with these endeavours and was fully informed of every move which was being made and fully consulted on any aspect which concerned the mushroom industry.

In the general rejoicing throughout the industry—it is nothing less than that—let it be fully realised that, in admitting his error, the Chancellor has increased in stature, for such an admission on the part of a key figure in Government is surely a sign of greatness and most certainly not a sign of weakness.

Facts and figures can at times be misleading but there is nothing misleading in the fact that the mushroom industry's fuel oil users, only incidently about 100 growers in all, consume about 2,500,000 gallons of fuel oil each year and the saving at 2d. per gallon amounts to over £20,000, which is nearly seven times the annual subscriptions received by the Association from *all members*, including Overseas and Associates. One way and another a few thoughts on these facts and figures can be somewhat sobering, in my opinion.

WRA

STARTLING DANISH EXPERIMENTS

Copenhagen Claims World Record Yield

Mr. C. Riber Rasmussen, head of mushroom research in Denmark, has, by obtaining 10.3 lb. of mushrooms per sq. ft. of bed space in 89 picking days, created what must be a world record yield under conditions which, he reckons, could become commercial practice within the next five to ten years.

The yield was achieved in trays with 11 inches of horse manure compost, prepared over 16 days. In the first 21 days of picking over 6 lb. of mushrooms per sq. ft. were harvested, the equivalent of about 578 lb. per ton of fresh manure. Even more strking is the figure of 10.3 lb. per sq. ft. which represents about 1,000 lb. of mushrooms (including stalks) per ton of fresh manure.

As to whether, in fact, these experiments can be translated into commercial practice remains to be seen but at least one well-known horticultural journalist, Mr. H. G. Schaffer, regards these latest experiments of Mr. Rasmussen as a major break-through.

Writing in *The Commercial Grower* Mr. Schaffer also describes another experiment by Mr. Rasmussen, which proved that the mushroom fruitbodies can extract, via the mycelium, nutrients from as far away as 72 inches although this occurred in the second flush, the first flush distance being up to 36 inches. These experiments were carried out in special trays, the actual growing area cased being 4 inches by 4 inches, leaving the rest of the trays uncased and the bed surface sealed off. Isotopes were inserted into the beds at the farthest point from the cropping surface and the mushrooms harvested were found to contain the isotope in question.

The facts and figures about the gigantic yields are translated from an article which appeared in *Gartner-Tidende* of May, 1961, and, with the pictures, were supplied to the MGA Bulletin by Mr. Rasmussen himself.

THE EXPERIMENTS

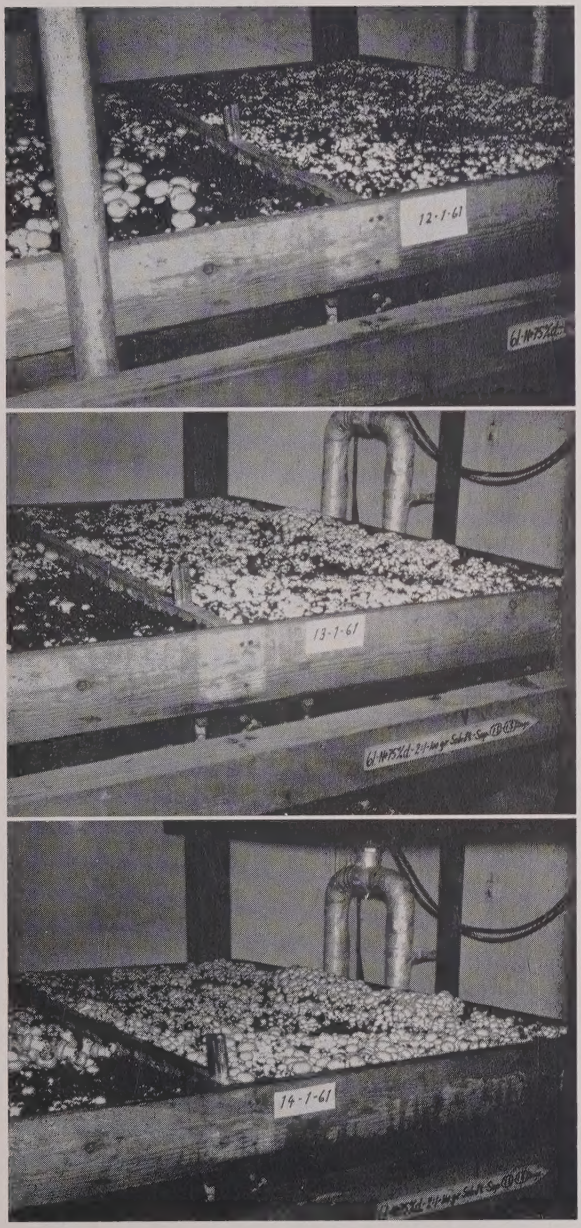
One experimental plot (1m=10.76 sq. ft.) was photographed at one-day intervals (2nd flush).

12th January, 1961

The second flush is appearing. There is a wealth of pinheads. A rough count showed 500-600 new mushrooms per square foot. The first flush has just been picked, yielding 1.92 lb. per sq. ft. in five days, average weight 0.35 oz.

13th January, 1961

When mushrooms come to a certain stage of development the daily growth increases considerably. Air conditions, and especially the temperature, influence the speed of growth. If the beds are densely crowded with mushrooms a temperature reduction to 54° F.—55° F. against the usual 61° F. is advantageous. In this way growth is slower and the mushrooms become less soft and long stalked.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14th January, 1961

As 1 sq. metre (approx. 10.76 sq. ft.) is 10,000 sq. centimetres the 500—600 mushrooms do not all have a chance to develop. Theoretically one mushroom needs an area of at least 8 sq. centimetres (1.24 sq. inch) to reach normal size, which means that only about 1,250 mushrooms per sq. metre (116 per sq. ft.) can mature and that only if the mushrooms are standing cap to cap. With an average weight of about 0.35 oz. it means a theoretical maximum yield of 12.5 kilos (about 2.55 lb. per sq. ft. per flush).

15th January, 1961

The mushrooms are now ready for picking. They form a completely solid 'carpet' and have practically covered the total surface. They are even growing over each other. In spite of this the quality is very good. A rought count showed that at least 1,500 mushrooms developed—the rest died out gradually.

16th January, 1961

The mushrooms ought to have been picked now, but we decided to let them continue growing in order to investigate how much "mushroom meat" could be produced per sq. metre (per 10.76 sq. ft.) in a single flush under given conditions.

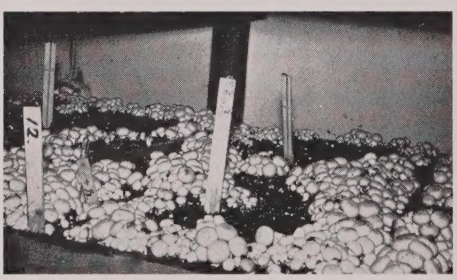
17th January, 1961

It is now evident that the mushrooms are going to open. They have, however, a marked ability to grow in layers, thus giving space for normal development of veils and spores. In Denmark such mushrooms cannot be sold, whereas in England it is possible to obtain 2/6—3/6 per lb.

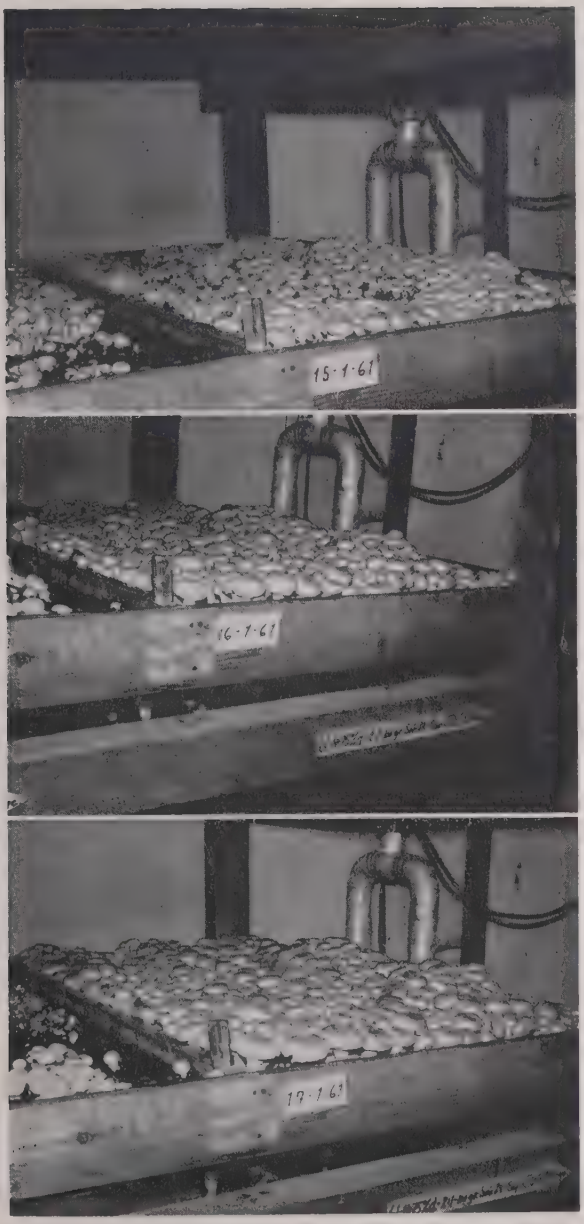
18th January, 1961

Sixteen hundred and one fully developed mushrooms were picked from the 1 sq. metre (10.76 sq. ft.) plot. Total weight: 3.39 lb. per sq. ft. The total yield of the first and second flushes amounted to 5.32 lb. per sq. ft. in the first twelve picking days with an average weight of 0.35 oz. This result equals 475 lb. of mushrooms per ton of fresh manure.

The photo shows the first flush from experimental plots, in which the mixed/through-spawning method was applied, i.e., the spawn—about $\frac{2}{3}$ oz. Sobexas 84 per sq. ft. of bed area—is distributed in the entire compost layer, 26 lb. per sq. ft., 11 inches deep, by mixing after pasteurization. Moreover, the same composting and pasteurization technique is used as mentioned for Super-Spawning. The mushrooms were, however, picked at normal size (closed).



The first flush gave 0.88 lb. per sq. ft. with an average weight of 0.64 oz.;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in the second flush, 3.08 lb. per sq. ft., average weight 0.45 oz.; and in the third flush, 2.17 lb. per sq. ft., average weight 0.35 oz., giving a total of 6.13 lb. per sq. ft. in the first 21 picking days with an average weight of 0.43 oz., which corresponds to the quality normally grown on practical farms. This result corresponds to 246 kilos mushrooms (542 lb.) per metric ton of fresh manure and must be considered as never reached before.

The compost was a 16-days horse manure (1.25% nitrogen on the dry matter on delivery) with the following turning schedule: —1, 0, 6, 10, 13, 15, and 16. At stacking were added 15.4 lb. of sulphate of ammonia, at the first turn 57.3 lb. calcium carbonate, at the second turn 15.4 lb. superphosphate and 57.3 lb. dehydrated gypsum (plaster). The compost was prepared as so-called "dead" compost and was completely free from ammonia at filling.

The outdoor composting was carried out very carefully. About 133 gallons of water were added per ton of fresh manure. At filling the compost had completely lost its activity, was soft, homogeneous dark brown and had a water-content of 71%—72%. There was a marked firefang formation throughout the pile at the third turn, after which operation the compost was placed in a layer about 20 inches deep.

The compost was filled at the rate of 17.2 lb. of compost per sq. ft. in 8 inch beds. On top of each plot trays 5.38 sq. ft. with about 92 lb. of compost were placed on wooden planks. The peak-heating was carried out as pasteurization without any air-supply. In course of 46 hours the temperature rose to 133° F.—136° F. Sixty-eight hours after start of steaming the compost was ready for spawning. Only the trays were spawned (150 grammes =approx 5.3 oz. of Sobexas 84 per tray), and the through/mixed-spawning method was used. The plots beneath the trays were covered with polyethylene film.

In course of 15 days the through/mixed-spawned trays were completely full-grown. Then the Super-Spawning was carried out, i.e., the full-grown trays (about 92 lb. of compost) were throughly mixed with the polyethylene-covered and non-spawned compost (originally 17.2 lb. per sq. ft.).

After two careful mixings the compost was again packed in the plots. It must be added that the edges of the plots were raised four inches by means of bed-boards to a total of 12 inches. The thickness of the compost layer was then 11 inches. At the same time the plots were cased with a mixture consisting of 1 bale of fine sphagnum peat plus 176 lb. fine sand gravel plus 18 lb. of calcium carbonate, which mixture during preparation had been made so wet that it was very easy to squeeze water out of it. A two-inch layer of this casing mixture took 5 lb. per sq. ft.

After the Super-Spawning the temperature in the compost was about 66° F., but in the course of 5—6 days it rose very much, owing to

the activity of the mycelium. Temperatures of 82° F.—84° F. were noted. The air temperature was reduced to 61° F.—63° F. If this is not done the mycelium might be killed. During these 5 – 6 days the spawn completely grew together in the compost and produced a solid growth in the casing. The first mushrooms were picked about 20 days after Super-Spawning.

CALYPSO . . .

EXPANSION BRINGS DIMINISHING RETURNS!

His mushroom beds are bulging heaps;
From dawn till dusk he works, and reaps
Success successively, from which
He hopes at last 'to strike it rich',
And not content with much wants more—
enthusiastic mushroom grower!
Beware, my lad, the hills look green,
Beware of pitfalls in between,
Avoid the pain of finger-burns—
Expansion wide depletes returns!
Unless, of course, you can apply
The keenest brains that you can buy:
Unless the team that you have built
Can get right down, nor spare the hilt,
And can adhere to methods clean
By knuckling down to strict hygiene:
Unless you choose to soil your 'paws'
In squeezing urine-sodden straws,
And can resolve to sit right back
With fingertips on every track:
Unless you are prepared to teach
Apprentices to fill each breach,
And can aquire the canning slant—
'Sell all you can, can all you can't':
Unless you choose the toughest lines
As need dictates when zeal declines,
And brainwash all to take a pride
In stepping-up expansion's stride:
Unless, all these, you wisely choose,
Instead of gain you stand to lose,
The goal you seek expansion spurns
And brings diminishing returns!

FP (BELFAST)

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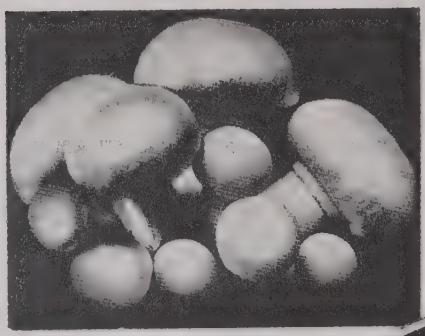

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HOUSE NO. 5 DATE SPAWNED 13th JULY

SPAWNED 23rd JULY 1960

SPAWN: DARLINGTON'S GRAIN

TRISH PEAT

	lb.		DAY	lb.	
1	31		32	–	
2	50		33	–	
3	–		34	246	
4	–		35	38	
5	757		36	–	2·80
6	149		37	43	(35
7	388		38	–	
8	–	·83 lb/sq/ft	39	–	
9	224	(7 days)	40	–	
10	–		41	150	
11	–		42	144	
12	–				3·00 lb/sq/ft
13	1158				(42 days)
14	493				
15	–	1·95 lb/sq/ft			
16	281	(14 days)			
17	–				
18	–				
19	122				
20	36				
21	81				
22	144	2·27 lb/sq/ft			
23	45	(21 days)			
24	–				
25	–				
26	–				
27	249				
28	–				
29	–	2·53 lb/sq/ft			
30	169	(28 days)			
31	–				

TOTAL PICK: 4998 lb.

AREA: 1660 sq ft on trays

YIELD: 3·00 lb/sq/ft

THE BEST THINGS IN LIFE ARE FREE

Why not use the NAAS more –says P. B. Stanley-Evans

. . . . or so a once popular song would have us believe ; it would also seem that they are sometimes not appreciated : could this have anything to do with the very fact that they *are* free?

It never fails to amaze me that so many growers make little or no use of the National Agricultural Advisory Service, and mushroom growers, undoubtedly the most enlightened and progressive members of the whole Industry, often seem to me to make even less use of it than other sections of horticulture.

The reason given by many mushroom growers for not using this excellent service, when they bother to think about it at all, is often connected with the undoubted fact that the local District or County Advisory Officer is unable to tell you how to improve your composts or to give constructive advice on some other highly complicated cultural problem—most of them wisely say that your guess on such a matter is in all probability likely to be much nearer to the mark than their's would be.

Surely it must be obvious that if a man who may have been visiting a cactus grower before he came to you and will be looking at a field of parsnips after he leaves you (a man who is the greatest Jack-of-all-Trades in existence) should walk on to your farm and tell you, who may have spent half your life in a turning shed, how to make compost . . . I trust that I have made my point abundantly clear!

But what so many people seem to ignore is that this same District Officer has a team of highly trained specialists on pests and diseases behind him and that he has been trained to take samples and to ensure that they reach the man who is best qualified to deal with them.

Even the most knowledgeable mushroom grower quite frequently comes up against conditions in his crops which he feels might be due to the presence of pests or diseases and in very many of these instances the NAAS will be able to provide a positive answer together with the lastest information on prevention or cure ; and in the cases when they can't, are you any the worse off for having asked for their opinion?

The more we mushroom growers use the NAAS the more they will learn about our problems and the more experts they will employ to solve those problems.

I myself use the NAAS pretty regularly and with good results. I just do not understand why so many other growers choose to ignore the splendid service offered.

ENTENTE CORDIALE

Mr. H. J. Barton of Winterpick Nurseries, Plummers Plain, Horsham, Sussex, England, is anxious to have a Summer Holiday exchange with his son for a French boy or girl aged 14-17 years. Any French growers interested should communicate with Mr. Barton direct.

OVERSEAS MEMBERS SUBSCRIPTIONS RAISED

Because of ever-increasing costs the subscription of overseas members to the MGA, whether growers or associates, is to be raised immediately to £5.

It was in January, 1950, that the subscription rate was fixed at £3 3s. 0d., and, in spite of a great increase in general costs and a sharp fall in the value of the £, a rise in the overseas subscriptions has been resisted for 11 years although United Kingdom Grower Members had their subscriptions raised, from £4 4s. 0d. to £6 6s. 0d. and £10 10s. 0d., several years ago.

The Association feels quite sure that members in countries abroad will appreciate the need for the increase and will continue their membership of the MGA.

DETAILS WANTED OF LOCAL PUBLICITY

The MGA Publicity Sub-Committee will be pleased to receive details of any local publicity in which members may have engaged from time to time.

These details, together with any conclusions drawn, may well be of considerable interest to the Committee, especially when planning future publicity activities. Members who may have some interesting information should send it to the MGA Secretary.

MUSHROOM PRODUCTION IN THE U.S.A.

16,681 lb. Per Annum Per Employee

Some interesting data on mushroom production in America, have been gathered by the American Mushroom Institute and a table of pertinent figures is produced herewith.

Producers, when making comparisons, should remember that the majority of growers in the United States grow mushrooms only for seven or eight months of the year.

Here, for growers outside America to get their teeth into, are some facts which emerge from the figures given.

The production of 126,092,669 lb. of mushrooms from 35,430,711 sq. ft. of bed space, represents 3.56 lb. per sq. ft. per year. With 7,559 people employed on the total area quoted, the ratio of sq. ft. per employee is 4,657.2—considerably higher than the average for the United Kingdom. The annual production per employee is 16,681 lb. and an investment of $56,243,501 represents 11s. 4d. per sq. ft.or £566 18s. 9d. per 1,000 sq. ft.

MUSHROOM INDUSTRY

IN THE UNITED STATES, April, 1961

	Square Feet	Annual Production (lb.)	Employees*	Investment ($)
California ..	2,113,321	13,267,382	759	3,169,981.00
Colorado ..	16,000	48,000	3	24,000.00
Delaware ..	1,600,000	4,800,000	200	2,400,000.00
Illinois	1,538,400	5,544,350	333	3,848,400.00
Indiana.. ..	180,000	630,000	52	270,000.00
Maryland ..	664,268	2,148,254	73	996,402.00
Massachusetts..	91,280	215,000	11	136,920.00
Michigan ..	765,090	4,644,000	182	2,000,270.00
Minnesota ..	106,000	530,543	34	159,000.00
Missouri ..	493,000	1,240,000	87	739,500.00
New Jersey ..	115,000	345,000	25	172,000.00
New York ..	2,179,500	13,068,600	313	3,269,250.00
Ohio	845,880	3,719,900	194	1,268,820.00
Oregon.. ..	300,000	2,100,000	125	450,000.00
Pennsylvania ..	24,057,732	71,551,746	5,000	36,791,098.00
Texas	6,000	10,000	1	9,000.00
Virginia ..	63,040	350,000	30	94,560.00
Washington ..	295,000	1,873,394	136	442,500.00
West Virginia	1,200	6,500	1	1,800.00
TOTALS ..	35,430,711	126,092,669	7,559	$56,243,501.00

*Engaged in growing only. About 5,200 persons are engaged in mushroom canning and furnishing supplies and services.

Survey conducted by American Mushroom Institute

MON-LOUGH
REGISTERED
GRAIN SPAWN
FOR EARLIER CASING AND
QUICK HEAVY CROPS OF
GOOD-SIZED MUSHROOMS OUR
ACTIVE MYCELIAL SPAWN
(Made under new Scientific Process)
ENSURES BEST RESULTS
Dispatched promptly to
any address in
Great Britain and Ireland
SIX OF THE EIGHT CUPS AT THE
NATIONAL MUSHROOM SHOW
AT WESTON-SUPER-MARE
WERE WON BY GROWERS
WHO USE THIS SPAWN
Monlough Food Production Co. Ltd.
BALLYCOWAN - BELFAST
'Phone : Carryduff 243 'Grams : "Monlough, Belfast"

MUSHROOM GROWERS LIMITED

It was announced at the recent annual general meeting of the MGA that the Executive Committee had decided to form a trading company known as Mushroom Growers Limited.

The actual decision to form a trading company was taken at the annual meeting of the Association in March, 1958 when it was unanimously decided " **to set up an organisation which would enable the Association to trade** " (*Bulletin* No. 101, May 1958).

At that time some form of co-operative was envisaged but, in the subsequent committee discussions on the matter, it was agreed that a trading company governed by a small board would be more efficient. It was also felt that, the main decision to form a trading company having been agreed, there was no urgency with regard to the actual formation until such time as the need arose. The Executive Committee have now decided that the matter should no longer be delayed.

Objects. The object of the Company is (a) to buy, sell and deal in requisites of every description for the mushroom industry and (b) to buy, sell and deal in mushrooms of every description ; to carry on business as growers, packers, sellers of and dealers in mushrooms of every description ; and to manufacture, process, buy, sell or deal in all edible and inedible products and by-products derived wholly or partially from mushrooms.

Safeguards. The Company is to be so constituted that there can be no possibility of it ever passing out of growers' control. It will be a private company limited by Shares under the Companies Act, 1948 and it is being formed under the aegis of the National Farmers' Union Development Company Limited. Initially the Company will have two members, The Mushroom Growers' Association and the NFU Development Company each of whom will nominate a representative to hold one voting share.

Directors. There shall be not less than three and not more than seven Directors. The NFU Development Company shall, so long as it is a member, nominate members of the Board, but so that in making such nominations the NFU Development Company shall regard the fact that the Chairman, Vice-Chairman and Honorary Treasurer of the Mushroom Growers' Association for the time being shall automatically be members of the Board and that the first Directors of the Company shall be Mr. Graham Griffiths (MGA Chairman), Mr. A. St. J. Berry (MGA Vice-Chairman) and Mr. F. L. Filmer (MGA Honorary Treasurer).

Finance. There shall be an authorised capital of £1,000 divided into 1,000 £1 shares and of the shares which it is decided to issue only two will carry voting rights, one such share being held by the Mushroom Growers' Association and the other by the NFU Development Company Limited.

It is proposed that the MGA shall take up the 998 £1 shares remaining and, although it is not proposed that the Company shall make any profits, such surplus as may be available from time to time remains with the MGA for distribution to members.

It cannot be too clearly stated that the main immediate object of the Company is to organise bulk purchases of fuel oil, trays and bed boards and boiler equipment and, for the time being, the Company does not envisage any extension of these activities. Circumstances may obviously arise when the scope of trading may have to be reconsidered.

Members who are considering the purchase of purpose-built trays or of boilers and ancillary boiler equipment should contact the MGA Secretary, who is also to act as secretary of the Company.

Should the arrangements outlined with the NFU Development Company prove unsatisfactory on either side, arrangements are being made for either side to be able to opt out of the arrangements on due notice.

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THE ACTIVE MYCELIUM IMPREGNATION METHOD AS A BASIS FOR ACTIVE MYCELIUM CULTIVATION PROCESS

By W. HUHNKE and R. v. SENGBUSCH

MAX PLANCK INSTITUTE FOR PLANT BREEDING
HAMBURG-VOLKSDORF

(*Director:* PROF. DR. R. v. SENGBUSCH)

I. Introduction

Reports have already been issued in a preliminary article on active mycelium impregnation method (HUHNKE & v. SENGBUSCH 1959). This method consists of "injecting" (incorporating) the pasteurised compost with sterile grain or manure spawn. Finally it is subjected to normal conditions of growth at 24° C. (75° F.) and to high atmospheric humidity. 14 days after this injection the "Aktivmycel" (active mycelium) is used for impregnation of the culture. Before impregnation it is reduced to very small pieces and mixed thoroughly with the compost.

We have given this mycelium the designation of "Aktivmycel" as it is in a condition of high breeding activity (as opposed to grain and manure spawn, in which the mycelium is generally dormant). It should be mentioned that it is possible to case the beds immediately after having been impregnated with active mycelium. Some 16 days after impregnation it is possible to harvest. During the course of the past few months far reaching research has been carried out with the active mycelium impregnation process. **Eger** (1960) has established, in checking the experiments of **C. R. Rasmussen**, that mycelium, which is in condition of extreme vegetative breeding activity and is shredded into extremely small pieces, unites again in a very short period. The commencement of the harvest and the yield of cultures with finely shredded mycelium conforms with that of correspondingly untreated cultures.

II. Mushroom cultivation by means of the active mycelium impregnation method

A. Preparation of active mycelium

1. Preliminary and main breeding activity—inclusive of reserve (safety method)

Our research and experiments have shown that preparation of active mycelium and particularly preparation to a time schedule occasionally encounters difficulties. These difficulties we attribute to the grain or manure spawn, which has been used by us for formation of the active mycelium, developing at different stages. We presume that the grain or manure spawn after having been stored for a long time becomes dormant. Spawn which is dormant has a much slower start than active spawn.

There are also trays in which active mycelium is produced; some produce a good and some a poor development of mycelium after casing. We have taken these boxes into normal culture, and it was revealed that the trays in which there was an intense development of the mycelium, had a considerably higher yield than the boxes in which there was a slow development of mycelium (Total yield 1.5 to 0.7 lb./sq. ft.) From this it was deduced that cultures which are impregnated with active mycelium of differently good quality would also give different yields.

It is therefore imperative to manufacture a good active mycelium, which is available at the exact time it is needed. Preparation of active mycelium has been carried out by us in the following manner. Four weeks before the active mycelium is intended for use, a pasteurised compost is impregnated with sterile grain or manure spawn, in accordance with the mixing process. In the normal course of events, fourteen days after this impregnation the compost has a complete through growth of mycelium. It then becomes suitable for use as active mycelium. With this active mycelium preliminary breeding activity is obtained in the ratio of 1 : 10 of the main breeding activity in pasteurised compost. For the impregnation of the cultures this active mycelium is applied on the basis of 1 : 10. The active mycelium is prepared in two successive stages: In a preliminary breeding activity from sterile spawn, and in a (main) breeding activity from the active mycelium formed from the preliminary breeding activity.

Should it happen that the preliminary breeding activity from sterile spawn does not run true to plan, the last preliminary breeding activity is held in reserve. It is suitable for production of main breeding activity some four weeks later.

On the basis of exhaustive research, we would like to warn against active mycelium being manufactured more than once from active mycelium.

B. Impregnation with active mycelium

1. Effective Quantity

As already indicated, a ratio of 1 : 10 (10% active mycelium basis) has been guaranteed as impregnation quota. If less than 5% is used then the effect of the active mycelium process is not apparent, if an excess over 10% is applied there is no increase in results obtained.

2. Mixed Spawning

The compost, which contains the active mycelium, is broken up very finely, and thoroughly mixed with the compost which is to be impregnated. For this mix-impregnation with active mycelium, the Hauser spawning machine is suitable. (See Illustration I).

3. Temperature of the compost during impregnation

The newly pasteurised compost to be impregnated should have a temperature of 24° C. 30° C. (75° F. 86° F.). We have established that growth of mycelium is retarded at a temperature below 20° C. (68° F.).

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C. The time for casing

In order to ascertain the most favourable interval before casing we have cased the compost impregnated with active mycelium after three different periods.

1. Immediately after the impregnation.
2. Seven days after impregnation.
3. 14 days after impregnation (usually normal)

With regard to the compost which was cased immediately after impregnation, it was possible to harvest some two weeks later.

In connection with the composts which were cased at a later period, the harvest was delayed by just as many days as the interval between impregnation and casing. These results and the final yields have decided us to case immediately after impregnation.

Illustration II shows three jars which have impregnations according to the different processes.

left: Normal grain-spawn impregnation,
centre: active mycelium,
right: Mixed spawning as per Hauser.

The jar containing active mycelium impregnation has been cased immediately after impregnation the other two jars 14 days after impregnation. The jars were photographed 16 days after impregnation. The jar with the active mycelium impregnation already shows the first fruit formations 16 days after the impregnation.

D. Measures to be taken with regard to cultures in the period from impregnation and casing to the beginning of the harvest (Temperature, humidity, and ventilation)

The grain spawn impregnated culture has a growing period of 14 days. During this period of maturity the room (area) temperature should be 24° C. (75° F.) and the atmospheric humidity approx. 100%. The supply of fresh air should be kept low. Finally, casing takes place and room temperature is reduced to 16° C. (61° F.) and atmospheric humidity to 90%. The supply of fresh air is increased. These two phases of 30 days altogether are brought down to 16 days in the case of impregnation with active mycelium. They are not separated from each other (14 days before casing and 16 days after casing), but the maturing and transposition to fruit formation takes place in half the time with the cased compost. We have tested and found suitable for cultures the following measures:

1. Temperature should be kept in the first instance for 3-4 days at 24° C. (75° F.) then reduced daily by about 1° C. (1·8° F.) so that 10 days after impregnation and casing, on appearance of fruit formations, the temperature is down to 16° C. (61° F.)

2. Atmospheric humidity is to be maintained during the first three days at 100% and finally reduced gradually to 90%.

3. The supply of fresh air is to be kept very low for the first three days, and on appearance of fruit formations is to be increased to the normal sequence which obtains during harvesting.

E. The effect of the active mycelium cultivation process on the extent and course of the harvest.

The course of a harvest based on active mycelium impregnation differs from that of grain spawn impregnation, in that the yield is extremely high during the first 2 – 3 weeks of the harvest. We are referring to an explosive type of yield with 50 kg. (10.2 lb./sq. ft.) compost per sq. m. giving in 2 weeks 8.3, in 3 weeks 9.7 kg. mushrooms/sq. m. and a total yield of 13.1. kg. mushrooms/sq. m. in 8 weeks (216 sq. ft. per ton of compost, giving 1.7 lb./sq. ft. in 2 weeks, 2.0 in 3 weeks, 2.7 final yield in 8 weeks). We have however observed cases in which the harvest in the first week amounted to 8.0 kg. (1.6 lb./sq. ft.) mushrooms per square metre. and then a lightning falling off of yield set in (see Illustration 3). With an active mycelium impregnation generally, there is harvested over a culture duration of 5 weeks the same as with grain spawn impregnation of 10 – 12 weeks (maturing time and harvesting time). From this it transpires that the active mycelium impregnation method against the balance of the harvest shows a quicker, up to almost doubled sequence of turnover of the culture, without showing any economical disadvantage due to compost and labour involved.

All the experiments carried out to date were with a compost quota of 50 kg./sq. m. (10.2 lb. sq. ft.). With this amount of compost the yield stated was obtained and also in the stated ratio of maturity (16 days) to harvest time (26 days including filling and emptying). The period of maturity amounts therefore to about 1/3 of the turnover period. We have carried out experiments in order to reduce the proportion of the " dead " time, if this were possible. The quantity of compost per sq. m. was increased to 60, 80, and 100 kg. (12.3 ; 16.0 ; 20.5 lb./sq. ft.) The first results showed that with a higher compost quota on the same period of maturity of 16 days, the high explosive type portion of the harvest was sustained up to 7 weeks (16.0 kg. or 13.3 lb./sq. ft. in 7 weeks).

By an increase in the compost quota per sq. m. we have a means of reducing the sequence of turnover and so reducing relatively the proportion of dead time.

It is of importance to note with these experiments, that in the use of this active mycelium also with 80 and 100 kg. compost/sq. m. the same effects are to be obtained as with a filling of 50 kg. compost/ sq. m.

We stress that special attention must be given at the time to the pasteurisation of the increased quantity of compost.

The weight of the heavy trays is a disadvantage as it requires a considerable expenditure of energy in changing around and re-stacking. We are of the opinion that increase of the compost quota per sq. m. is only justified when this turning and stacking of trays can be carried out mechanically.

There are certain other points of organisation which will determine whether the filling should consist of this or that amount.

Unfortunately there is no possibility of carrying out precise yield experiments for comparison between active mycelium impregnation and grain spawn impregnation. The fundamental reasons for this are the

differential culture measures, which condition the varying periods from impregnation to harvest. We are unable therefore to submit any details to testify whether total yield after active mycelium impregnation is higher or lower than with grain spawn impregnation. From the fact that in our cultures, the yields were considerably higher after introduction of the active mycelium impregnation process than before with the grain spawn impregnation method, we have also come to the conclusion that the total yield on application of the active mycelium process is higher than with the grain spawn method (see Illustrations 4, 5 and 6).

Our experiments have shown that with inferior compost this poor compost has a higher and surer yield when impregnated with active mycelium compared with grain spawn.

Active mycelium process also limits the attack by parasites pests. In the case of quicker turnover, areas can be disinfected at shorter intervals. By means of active mycelium impregnation method the mushroom is fortified in its competitive struggle, and on account of the short period of vegetation there is less chance of parasite pest development. Before they have developed to the stage where they can exercise a harmful effect, the culture is finished.

There are a series of differences between the active mycelium impregnation and the grain spawn impregnation. The spawn running area in the case of the tray system is not needed. On the other hand space is required for the production of the active mycelium for initial and main breeding activity. The size of this space for the production of the active mycelium amounts to about one-eighth of the normal cultivation area.

In the shelf system, introduction of the active mycelium results in a reduction of 14 days in the time between the commencement of the pasteurisation and the beginning of the harvest.

In the tray system, which we use, there is the saving of labour which is involved with placing the trays in the pasteurisation room and the separation of the trays for casing. Immediately after impregnation and casing the boxes can be placed in the growing rooms.

F. Effect of the active mycelium cultivation process on organisation of cultivation centres

The main part of the harvest is in the first two to three weeks of the active mycelium process. This from the point of organisation has the following consequences: the normal harvest period, inclusive of time for maturing, in the case of the grain spawn method amounts to 10 to 12 weeks. Through the explosive manner of cropping by means of the active mycelium process we have the possibility of being able to shorten this period to 5—6 weeks, i.e., 2 weeks from impregnation and casing to harvest, 3 weeks harvest and a week for clearing and restocking. Such a curtailment of the harvest period means on the one hand a doubling of turnover per cubic metre of space, and on the other hand also a doubling of the requirements of compost and labour. Economically, and from the point of view of organisation, a deciding factor must be to establish the optimal turnover period for the business.

The increase of turnover sequence in conjunction with a corresponding increase in gross and net proceeds must create the possibility of increased mechanisation of the business.

G. Summary

In conclusion we may summarise that the active mycelium process should commence with sterile spawn, then go over into the initial breeding and finally into the main breeding of the active mycelium. The last initial breeding activity will always be held in reserve (safety method). The compost with active mycelium is finely broken up and then mingled with the culture compost. The temperature of the culture compost should be 24° C. to 30° C. (75° F.—86° F.). Immediately after impregnation with active mycelium, casing should take place. Temperature, humidity, and fresh air control after casing, for four days the same as in the spawn-running room, then gradually changing to conditions which obtain at the time of the harvest.

At the commencement of the harvest 16 days after impregnation and casing, there is an explosive yield curve in the first three weeks. On the basis of practical results there is a higher overall yield as opposed to grain spawn impregnation.

The active mycelium process makes possible on the one hand a higher turnover frequency of the cultures, on the other hand it demands a higher requirement of compost and labour. Through the increased yields per space unit there is a need for mechanisation. Active mycelium process offers advantages for cultivation on shelves and also for cultivation in trays.

There are economic aspects which govern the optimal turnover sequence of one or the other system. The introduction of the active mycelium impregnation process has proceeded to an active mycelium cultivation method. It will be necessary to study the individual sections of this entire complex in order to ascertain conditions which obtain for economical structure of mushroom cultivation.

Hühnke, W. together with Sengbusch, R. v. "Aktiv-Mycel-Spickung" von Champignonkulturen. Active mycelium impregnation of mushroom cultures. German Market Gardening, Vol. 7, Copy 12, 1959.

Eger, G. Does fragmented mushroom mycelium coalesce, and what is its yield in fruit formation? German Market Gardening No. 7, 1960.

Dr. G. W. Chapman: Into what size fragments did you break the active compost before innoculating the growing compost?

Dr. von Sengbusch: We did the last breaking up process with the aid of a Sinden and Hauser machine and we added about 10% of the active compost to the inactive trays.

Mr. C. R. Rasmussen : What happens if the active mycelium method is used more than twice to reproduce? Are your yields with or without stalks?

A. : In the early stages we tried to make this reproduction many times over but we noticed diminishing yields and we thought that perhaps this might be due to increased nematode activitity, especially at temperatures of 74° F. or over. I must emphasise that our work is in the very early stages and we have been working with active mycelium for about a year and although we have a new trial every two weeks it is really not enough to study all the possibilities and all the dangers. It seems to us that the development of active mycelium depends to a large extent on grain spawn and the quick mycelium run. The yields were recorded without stalks.

Dr. Chapman : How long could you keep the active mycelium if you found you were not ready to use it after the fourteen day period?

A. : Perhaps, if, as Mr Rasmussen suggests, it was kept in a cool place, it could be stored for a long period but there is some danger in this because you change a state of activity to one of inactivity.

Mr. G. W. Baker : Mightn't this method put some of our spawn makers and merchants out of business and so ruin our Publicity Levy scheme?

A. : The scientist does not ask whether this or that is good for the individual. He asks only whether it is good from a cultural point of view. It is a new challenge for the spawnmaker because we must now have spawn which is absolutely fresh. It is essential with the active mycelium method that the spawn grows right away.

Mr. R. Thompson : Could not the first two stages be avoided by using manure spawn?

A. : I have not had much experience with manure spawn because all our main trials have been conducted with grain. This and many other questions I cannot answer. It may well now be necessary to examine the difference between the behaviour of grain and manure spawn. These experiments cost money and we have to be careful.

Dr. Chapman : A compost containing less nitrogen gives a faster growth so do you not think that such a compost is more suitable for active mycelium growth?

A. : It is possible that a compost less rich in nitrogen is better but, as I have said before, we are only at the beginning in these experiments.

Mr. R. Dumbreck : Can you tell us that if the method of culture as laid down by you is not strictly followed, any abnormal growth occurs?

A. : I wouldn't really know because we follow the strict procedure to which you refer. Certainly the better the compost the better the yield. Dr. von Sengbusch, in reply to another query, explained that, in the Max Planck experiments, casing took place 14 days after spawning and the spawn growth, with the active mycelium method, was explosive.

This spawning after 14 days was the normal way but, with the abnormal growth following the active mycelium method the casing period was shortened. Casing immediately after the mixing of active mycelium was certainly the better.

Mr. T. Figgis : If you used more grain spawn and ran the active mycelium culture through only one stage instead of two, and ran the one stage for three weeks instead of two, would not that be better?

A. : That is perhaps possible but we have found that, unless the initial spawn run is extremely quick it is not possible to obtain a normal active mycelium run when it comes to the main propagation.

Ed. note : During this question and answer session Mr. W. Helm, an Essex grower, acted as interpreter.

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For the time being members will continue to be charged the additional 2d per gallon fuel oil tax but arrangements are being made whereby the amount of tax so paid can be reclaimed. Full details will be published as soon as they become available.

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During a recent business trip to Australia, Mrs. Hauser of the Sinden-Hauser organisation at Gossau, Zurich, Switzerland, gave a talk to Australian mushroom growers in the Hotel Australia, Sydney, on her experiences in the mushroom industry. She was enthusiastically received and afterwards answered a number of questions.

SMALL ADVERTISEMENT (*Contd. on page 272*)

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The 'basket' we hope, will be a programme of town promotions, about six to eight a year culminating, possibly, in a national mushroom week. However, before committing ourselves definitely to this programme we held a trial run in Oxford during the first week in May. During the week we tried to find out if a promotion lasting only a week could be of any use (a) in the short term and (b) in the long term. We also tried to show how possible it was to get accurate figures by which to measure our success or failure and, beyond this, experimented with various methods of gaining and holding interest.

In order to judge the degree of success our promotion yielded, we measured the sales in Oxford during the week preceding the Mushroom Week, during the Week itself and again a fortnight later. Then these results were all double-checked and any abnormal influence guarded against by measuring the sales in Cheltenham for the same period. Yet a further check may be held in the autumn to ascertain the results over a longer period.

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GRAIN OR MANURE

We started serious detailed preparation for the Oxford week at the beginning of April when, having obtained the names of all the Oxford greengrocers, we issued a circular explaining our aims and offering an abundance of publicity material.

This was followed by further reminders, and entry forms for a window dressing competition were sent out. Finally Mr. Morrish, our Public Relations consultant, went down to Oxford in the week preceding the promotion and visited most of the greengrocers, taking with him more posters, leaflets and paper bags and offering to put up posters to encourage a good display. We also advertised on the Oxford buses and in the two Oxford papers: on the Friday before the mushroom week the *Oxford Mail* and the *Oxford Times* gave us a special supplement and local greengrocers, wholesalers and a local grower gave generous support by taking advertising space for mushrooms in these papers. This was followed up by daily advertisements during the promotion week itself, giving a new recipe each day and also publicising our cookery demonstrations.

The cookery demonstrations proved to be most disappointing from an attendance point of view mainly because insufficient notice was given. In future we shall plan to write to all the women's groups at least three months ahead and to issue them with tickets for the public demonstrations as well as offering them private lectures and demonstrations. When we have done this we will be able to make a more accurate estimate of the value of the demonstrations.

We had thought at the beginning of the Week that our window dressing competition was also going to be disappointing but in the end we were very pleased with the results. The entry was small, although the first prize of £50 had seemed to us very tempting, but we were pleased to have the entries of Woolworths and the Co-operative Society together with entries from several smaller retailers. In the end it was the smaller retailer who carried off the first three prizes. Their displays were all excellent and well planned to encourage mushroom sales. There was not however, any great difficulty in choosing the winner: Mr. Reed of Fruitfare had used great ingenuity to recreate with mushrooms the figure of Monty Mushroom and had then put up an excellent display, emphasising the versatility of mushrooms throughout the day and throughout the year. These retailers threw themselves into the mushroom week with much enthusiasm and were rewarded with a great increase in sales, as well as their prizes. This proves, as Mr. Allen told the prize-winners, that given a good display, mushrooms will bring good sales.

The week as a whole can be regarded as a success. It seemed that the retailers were willing to make a special effort when there was a promotion with a certain amount of encouragement and the help of several personal visits by Mr. Morrish and the MGA staff. But, strangely, in spite of these results the retailers were damning about a policy which

was planned to work through the retailers' shops. In discussion at a reception after the week most of them said that they did not like posters and very seldom used them and that they had very little use for display material of that sort. They were also unenthusiastic about price tickets (another idea we had been considering).

This brings us up against a series of contradictions: the display we saw in Oxford was excellent yet the greengrocers said that they would not normally be able or willing to do it and advised us to direct any campaigns we might plan at the consumer: and again although their attitude was at times discouraging many were very pleased at the success of the week and increase in sales was general and one of the wholesalers reported a 400% increase by mid-week.

The general conclusion I would draw from this is that it is possible to effectively increase mushroom sales by means of special town promotions organising them in co-operation with the retailers, with the Press and with whatever publicity machinery the town involved may possess; but I would agree with the greengrocers that, out of the context of the special promotion week and the interest and extra drive which surround it, the distribution of publicity material to retailers is unlikely to have very much success. The retailer may co-operate after he has been approached personally and for a special occasion but he is unlikely to feel sufficiently enthusiastic about any general postal distribution of advertising material to do anything at all about it. I feel therefore that it would be wise to withdraw from a policy of general distribution of publicity material to retailers, particularly as the results of our recent poster distribution bears out all the Oxford retailers told us; but I would not want to withdraw from town promotions. Oxford as a whole was a success and although it is true that it is difficult to find publicity-minded greengrocers we have found that it is possible to gain co-operation and very effective support for a town promotion. Further, it is most important to remember that the decision about this programme has to be made in the context of our financial position. We can afford the town promotions and we can, by concentrating our efforts within the limits of a single well-defined sphere of activity, make an important impact on many areas. To turn now, as the Oxford retailers suggest, to attacking the consumer directly would, within the financial limits which are imposed on us, make us look, and feel, like a small boy trying to 'bag' an elephant with a pea-shooter.

Finally, a note for the grower. Several retailers said they would sell more mushrooms if they could get good supplies. One in particular said that in the past his sales had dropped from over 200 to 20 chips a week simply because he could not get regular direct supplies of good mushrooms. Here is a challenge for a new approach to marketing organisation and an encouragement to every grower with a retail round: according to the Oxford retailer the services of such a grower are at a premium.

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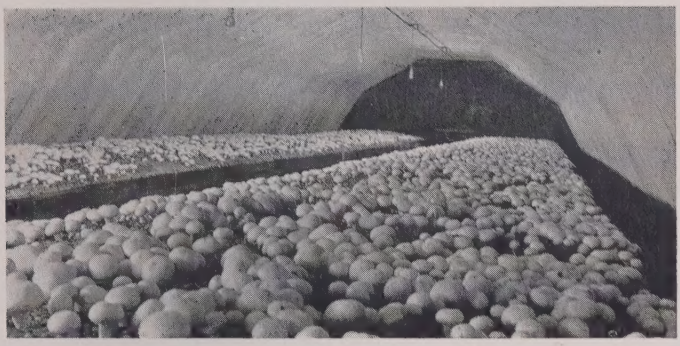

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